Welcome and Introduction
Ryan M. Colker, National Institute of Building Sciences

DOE Initiatives to Advance Energy Efficient Buildings
Cindy Zhu, U.S. Department of Energy

Impact of Energy on Default Risk in Commercial Mortgages
Paul Mathew, Lawrence Berkeley National Laboratory
Nancy Wallace, UC Berkeley Haas School of Business

Appraising Green Buildings
Andrew White, JDM Associates

Questions & Answers
Public Law 93-383, Sect. 809

Congress directed the Institute to “exercise its functions and responsibilities in four general areas……….”

- **Develop and maintain** performance criteria for maintenance of life, safety, health, and public welfare for the built environment
- **Evaluate and prequalify** building technology and products
- **Conduct** related and needed investigations
- **Assemble, store, and disseminate** technical data and related information

National Institute of Building Sciences
Council on Finance, Insurance and Real Estate

• Examines intersection of finance, insurance, investment and design, construction and ownership to encourage development and assist in affordability of high-performance buildings

• Provides an objective source for information and identification of valid performance methodologies and a forum for the AEC and finance and insurance industries to understand perspectives/concerns and engage in problem solving
Private financial institutions may have the most potential to scale and transform the retrofit finance market by integrating performance-based retrofit finance within their normal mortgage and refinance lending programs. Given growing recognition of the value created by energy retrofits, such integration could increase collateral values and limit default risk. Such change will require education of financial institutions and borrowers and legal work to address mortgage and related securities documentation.
Incentivization and the Role of Finance

The most cost-effective manner to achieve resilience is through a holistic and integrated set of public, private and hybrid incentivization programs including mortgages, insurance, finance, tax incentives and credits, and grants.

http://www.nibs.org/MMC
Energy in Commercial Mortgages and Appraisals

September 28, 2017
DOE Better Buildings Alliance

MARKET SOLUTIONS FOCUS AREAS
- Energy Efficiency Project Financing
- Leasing and Tenant Build-Out
- Energy Data Access
- High Performance Property Valuation and Mortgages

TECHNOLOGY RESEARCH TEAMS
- Commercial Real Estate
  - Lighting & Electrical
  - Space Conditioning
  - Plug & Process Loads
  - Refrigeration
- Food Service, Retail, and Grocery
- Healthcare
- Hospitality
- Higher Education
- Energy Management Information Systems
- Renewables Integration
- Building Envelope
What about commercial mortgages?

Commercial mortgages currently do not fully account for energy factors in underwriting and valuation…

…energy efficiency is not properly valued and energy risks are not properly assessed and mitigated.

Commercial mortgages are a large lever and could be a significant channel for scaling energy efficiency.
The link between energy and valuation

Energy directly affects Net Operating Income (NOI) used in valuation.

**Energy Use Volume**
- Electricity kWh/kW, fuel therms, etc.
- Driven by bldg. features, operations, climate

**Energy Use Volatility**
- +/- change over mortgage term
- Driven by bldg operations, weather variation

**Energy Price**
- $/kWh, $/kW, $/therm
- Set by rate structure

**Energy Price Volatility**
- +/- change over mortgage term
- Driven by rate structure, forward price curves

Current practice does not fully account for these factors in calculation of Net Operating Income (NOI)
- Usually based on historical average cost data, if available
- Does not account for energy use and price volatility during mortgage term

**Key question:** How much do these factors “move the needle” for NOI and default risk?
Approach: Impact of energy on default rate

Empirical analysis combining
- Mortgage loan data (TREPP)
- Energy use data (Benchmarking disclosure)
### Default risk and source EUI: Office and Retail – Linear probability model

<table>
<thead>
<tr>
<th>Term</th>
<th>Coefficient Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.40444**</td>
<td>0.18466</td>
</tr>
<tr>
<td>Log Source EUI</td>
<td>0.07335**</td>
<td>0.03129</td>
</tr>
<tr>
<td>Origination Loan-to-Value Ratio</td>
<td>0.00258***</td>
<td>0.00096</td>
</tr>
<tr>
<td>Coupon Spread to 10 Year Treasury</td>
<td>0.02188</td>
<td>0.01565</td>
</tr>
<tr>
<td>Electricity Price Gap</td>
<td>0.00003***</td>
<td>0.00001</td>
</tr>
<tr>
<td>Time to Maturity on Balloon</td>
<td>-0.00189***</td>
<td>0.00060</td>
</tr>
<tr>
<td>Origination Year Fixed Effects</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

N = 473  
R2 = .1052

* p<0.1; ** p<0.05; ***p<0.01
The coefficient estimates for BOTH the Electricity Price Gap and Source EUI are significant at better than the .05 level of statistical significance.

Both coefficient estimates are also economically meaningful:

- The higher the Source EUI (the more energy usage per square foot) the higher the likelihood of default.
- The higher the Electricity Price Gap, (the larger the difference between the actual and the expected electricity prices since the loan origination), the higher the likelihood of default.
What are the impacts on specific loans?

Collaborate with lenders to:

1. Demonstrate impact of energy use and price on specific mortgage loans
2. Develop recommendations

Approach

- Compile info from Appraisals, PCAs, other sources.
- Estimate source EUI variations.
  - Simulation and empirical approaches
- Compute elec price gap using forward curves.
- Compute default risk impact due to source EUI and elec price gap.
Case studies

San Jose Office

Denver Office

San Francisco Multi-family

Sonoma Office

Denver Hotel
A wide range of operational factors affect year-to-year energy use variations

<table>
<thead>
<tr>
<th>Facilities management</th>
<th>Occupant behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economizer settings</td>
<td>Lighting controls</td>
</tr>
<tr>
<td>VAV box minimum flow setting</td>
<td>Window operation</td>
</tr>
<tr>
<td>Supply air temperature reset</td>
<td>Thermostat setpoints/setback</td>
</tr>
<tr>
<td>Static pressure reset</td>
<td>Local heating/cooling equipment</td>
</tr>
<tr>
<td>Chilled water/Hot water supply</td>
<td>Plug in equipment</td>
</tr>
<tr>
<td>temperature reset</td>
<td></td>
</tr>
<tr>
<td>Condenser water temperature reset</td>
<td></td>
</tr>
<tr>
<td>Chiller /boiler sequencing</td>
<td>Maintenance</td>
</tr>
<tr>
<td>...</td>
<td>Damper/valve check</td>
</tr>
<tr>
<td>Weather</td>
<td>Filter change</td>
</tr>
<tr>
<td>Vacancy rates</td>
<td>Coil cleaning</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>
## Denver Office - Range of practice

<table>
<thead>
<tr>
<th>Factor</th>
<th>Good practice</th>
<th>Average practice</th>
<th>Poor practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lighting controls</strong></td>
<td>Daylight-dimming + occ sensor</td>
<td>Occ sensor only</td>
<td>Timer only</td>
</tr>
<tr>
<td><strong>Plug load controls</strong></td>
<td>Turn off when occupants leave</td>
<td>Sleep mode by itself</td>
<td>No energy saving measures</td>
</tr>
<tr>
<td><strong>Plug load intensity</strong></td>
<td>0.4 W/sf</td>
<td>0.75 W/sf</td>
<td>2.0W/sf</td>
</tr>
<tr>
<td><strong>Occupant density</strong></td>
<td>400 sf/per</td>
<td>200 sf/per</td>
<td>130 sf/per</td>
</tr>
<tr>
<td><strong>Occupant schedule</strong></td>
<td>8 hour WD</td>
<td>12 hour WD</td>
<td>16 hour WD</td>
</tr>
<tr>
<td><strong>HVAC schedule</strong></td>
<td>optimal start</td>
<td>2hr +/- Occupant sch</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Thermostat settings</strong></td>
<td>68°F heating, 78°F cooling Setback: 60 - 85</td>
<td>70°F heating, 76°F cooling Setback: 68 - 80</td>
<td>72°F heating, 74°F cooling No setback</td>
</tr>
<tr>
<td><strong>Supply air temp reset</strong></td>
<td>Reset base on warmest zones</td>
<td>Reset based on stepwise function of outdoor air temperature</td>
<td>Constant supply air temperature</td>
</tr>
<tr>
<td><strong>VAV box min flow settings</strong></td>
<td>15% of design flow rate.</td>
<td>30% of design flow rate.</td>
<td>50% of design flow rate.</td>
</tr>
<tr>
<td><strong>Economizer controls</strong></td>
<td>Enthalpy</td>
<td>Dry bulb</td>
<td>none/broken</td>
</tr>
</tbody>
</table>
Denver Office – Source EUI variations

Denver Office - Relative Change in Source EUI

- LightingCtrl
- PlugloadCtrl
- PlugloadDensity
- OccDensity
- OccSch
- HVACsch
- ThermoSet
- SAT
- VAV/min
- Economizer

[Bar Chart showing relative change in source EUI for different categories, with Lighting and Plug load under Lighting, Occupant, HVAC, and Good practice versus Poor practice depicted]
Denver Office: Energy use and default risk

Facilities Management factors:
- HVAC schedule
- Thermostat setback
- Supply air temp control
- VAV min flow control
- Economizer controls
- Lighting controls

*Levels: good, avg, poor*

<table>
<thead>
<tr>
<th>Case</th>
<th>Fac mgmt factors</th>
<th>Occ Factors</th>
<th>Source EUI change (%)</th>
<th>Default risk change (bp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Good</td>
<td>Good/Low</td>
<td>-54%</td>
<td>-248</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>Ave</td>
<td>-33%</td>
<td>-127</td>
</tr>
<tr>
<td>3</td>
<td>Ave</td>
<td>Ave</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>Poor/High</td>
<td>+4%</td>
<td>+12</td>
</tr>
<tr>
<td>5</td>
<td>Poor</td>
<td>Good/Low</td>
<td>+64%</td>
<td>+158</td>
</tr>
<tr>
<td>6</td>
<td>Poor</td>
<td>Ave</td>
<td>+76%</td>
<td>+181</td>
</tr>
<tr>
<td>7</td>
<td>Poor</td>
<td>Poor/High</td>
<td>+132%</td>
<td>+268</td>
</tr>
</tbody>
</table>

Occupancy factors:
- Occupant density
- Occupant schedule
- Plug load density
- Plug load controls

*Levels: good/low, avg, poor/high*
Denver:
Energy price and default risk

Mean: +330 bp
1 Std dev: -159 - 501 bp
Denver Hotel: Energy use and default risk

Guest rooms
- Vacancy levels: 10%, 35%, 50%
- Vacant room controls: good, ave, poor

Common areas:
- Thermostat setback
- Economizer controls
- Lighting controls
- Hot water settings
  **Levels: good, ave, poor**

<table>
<thead>
<tr>
<th>Case</th>
<th>Guest room vacancy level</th>
<th>Guest room controls</th>
<th>Common area practice</th>
<th>Source EUI change (%)</th>
<th>Default risk change (bp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35%</td>
<td>Ave</td>
<td>Ave</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>35%</td>
<td>Good</td>
<td>Good</td>
<td>-7%</td>
<td>-23</td>
</tr>
<tr>
<td>3</td>
<td>35%</td>
<td>Good</td>
<td>Ave</td>
<td>-4%</td>
<td>-12</td>
</tr>
<tr>
<td>4</td>
<td>35%</td>
<td>Poor</td>
<td>Ave</td>
<td>+12%</td>
<td>+36</td>
</tr>
<tr>
<td>5</td>
<td>35%</td>
<td>Poor</td>
<td>Poor</td>
<td>+17%</td>
<td>+49</td>
</tr>
<tr>
<td>6</td>
<td>10%</td>
<td>Good</td>
<td>Ave</td>
<td>+7%</td>
<td>+22</td>
</tr>
<tr>
<td>7</td>
<td>10%</td>
<td>Ave</td>
<td>Ave</td>
<td>+8%</td>
<td>+24</td>
</tr>
<tr>
<td>8</td>
<td>10%</td>
<td>Poor</td>
<td>Ave</td>
<td>+12%</td>
<td>+35</td>
</tr>
<tr>
<td>9</td>
<td>50%</td>
<td>Good</td>
<td>Ave</td>
<td>-11%</td>
<td>-37</td>
</tr>
<tr>
<td>10</td>
<td>50%</td>
<td>Ave</td>
<td>Ave</td>
<td>-5%</td>
<td>-17</td>
</tr>
<tr>
<td>11</td>
<td>50%</td>
<td>Poor</td>
<td>Ave</td>
<td>+12%</td>
<td>+36</td>
</tr>
</tbody>
</table>
Sonoma Office: Energy use and default risk

Facilities Management factors:
- HVAC schedule
- Thermostat setback
- Supply air temp control
- VAV min flow control
- Economizer controls
- Lighting controls

Levels: good, avg, poor

Occupancy factors:
- Occupant density
- Occupant schedule
- Plug load density
- Plug load controls

Levels: good, avg, poor

<table>
<thead>
<tr>
<th>Case</th>
<th>Fac mgmt factors Level</th>
<th>Occ Factors Level</th>
<th>Source EUI change (%)</th>
<th>Default risk change (bp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Good</td>
<td>Good</td>
<td>-40%</td>
<td>-161</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>Ave</td>
<td>-18%</td>
<td>-63</td>
</tr>
<tr>
<td>3</td>
<td>Ave</td>
<td>Ave</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>Poor</td>
<td>+86%</td>
<td>+197</td>
</tr>
<tr>
<td>5</td>
<td>Poor</td>
<td>Good</td>
<td>+32%</td>
<td>+87</td>
</tr>
<tr>
<td>6</td>
<td>Poor</td>
<td>Ave</td>
<td>+66%</td>
<td>+162</td>
</tr>
<tr>
<td>7</td>
<td>Poor</td>
<td>Poor</td>
<td>+183%</td>
<td>+331</td>
</tr>
</tbody>
</table>
San Jose Office: Energy use and default risk

Facilities Management factors:
- HVAC schedule
- Thermostat setback
- Supply air temp control
- VAV min flow control
- Economizer controls
- Lighting controls

*Levels: good, avg, poor*

<table>
<thead>
<tr>
<th>Case</th>
<th>Fac mgmt factors Level</th>
<th>Occ Factors Level</th>
<th>Source EUI change (%)</th>
<th>Default risk change (bp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Good</td>
<td>Good</td>
<td>-62%</td>
<td>-308</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>Ave</td>
<td>-38%</td>
<td>-152</td>
</tr>
<tr>
<td>3</td>
<td>Ave</td>
<td>Ave</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>Poor</td>
<td>+36%</td>
<td>+97</td>
</tr>
<tr>
<td>5</td>
<td>Poor</td>
<td>Good</td>
<td>+15%</td>
<td>+43</td>
</tr>
<tr>
<td>6</td>
<td>Poor</td>
<td>Ave</td>
<td>+42%</td>
<td>+111</td>
</tr>
<tr>
<td>7</td>
<td>Poor</td>
<td>Poor</td>
<td>+119%</td>
<td>+249</td>
</tr>
</tbody>
</table>

Occupancy factors:
- Occupant density
- Occupant schedule
- Plug load density
- Plug load controls

*Levels: good, avg, poor*
San Francisco multi-family: Energy use and default risk

Residential Units
- Daytime occ. levels: 30%, 60%, 5%
- HVAC, lights practice: good, ave, poor
- Plug loads: low, ave, high

<table>
<thead>
<tr>
<th>Case</th>
<th>Daytime occ. level</th>
<th>Res unit practice</th>
<th>Plug loads</th>
<th>Common area practice</th>
<th>Source EUI change (%)</th>
<th>Default risk change(bp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30%</td>
<td>Ave</td>
<td>Ave</td>
<td>Ave</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>30%</td>
<td>Good</td>
<td>Low</td>
<td>Good</td>
<td>-20%</td>
<td>-72</td>
</tr>
<tr>
<td>3</td>
<td>30%</td>
<td>Good</td>
<td>Low</td>
<td>Poor</td>
<td>-2%</td>
<td>-7</td>
</tr>
<tr>
<td>4</td>
<td>30%</td>
<td>Ave</td>
<td>Ave</td>
<td>Good</td>
<td>-12%</td>
<td>-40</td>
</tr>
<tr>
<td>5</td>
<td>30%</td>
<td>Ave</td>
<td>Ave</td>
<td>Poor</td>
<td>+7%</td>
<td>+21</td>
</tr>
<tr>
<td>6</td>
<td>30%</td>
<td>Poor</td>
<td>High</td>
<td>Good</td>
<td>+7%</td>
<td>+22</td>
</tr>
<tr>
<td>7</td>
<td>30%</td>
<td>Poor</td>
<td>High</td>
<td>Poor</td>
<td>+26%</td>
<td>+74</td>
</tr>
<tr>
<td>8</td>
<td>60%</td>
<td>Good</td>
<td>Ave</td>
<td>Ave</td>
<td>+1%</td>
<td>+2</td>
</tr>
<tr>
<td>9</td>
<td>60%</td>
<td>Ave</td>
<td>Ave</td>
<td>Ave</td>
<td>+2%</td>
<td>+5</td>
</tr>
<tr>
<td>10</td>
<td>60%</td>
<td>Poor</td>
<td>Ave</td>
<td>Ave</td>
<td>+7%</td>
<td>+23</td>
</tr>
<tr>
<td>11</td>
<td>5%</td>
<td>Good</td>
<td>Ave</td>
<td>Ave</td>
<td>-8%</td>
<td>-28</td>
</tr>
<tr>
<td>12</td>
<td>5%</td>
<td>Ave</td>
<td>Ave</td>
<td>Ave</td>
<td>-7%</td>
<td>-23</td>
</tr>
<tr>
<td>13</td>
<td>5%</td>
<td>Poor</td>
<td>Ave</td>
<td>Ave</td>
<td>+9%</td>
<td>+26</td>
</tr>
</tbody>
</table>

Common areas
- Thermostat setback
- Lighting controls
- Hot water settings
  Levels: good, ave, poor
Northern California: electricity price and default risk

Mean: +328 bp
1 Std dev: -49 - 705 bp
# Default risk impacts summary

<table>
<thead>
<tr>
<th>Building</th>
<th>Source EUI variation (%)</th>
<th>Default rate variation (bp)</th>
<th>Default rate variation relative to TREPP avg (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denver Office</td>
<td>-54% to +132%</td>
<td>-248 to +268</td>
<td>-31% to +34%</td>
</tr>
<tr>
<td>Sonoma Office</td>
<td>-40% to +183%</td>
<td>-161 to +331</td>
<td>-20% to +41%</td>
</tr>
<tr>
<td>San Jose Office</td>
<td>-62% to +119%</td>
<td>-308 to +249</td>
<td>-39% to +31%</td>
</tr>
<tr>
<td>Denver Hotel</td>
<td>-11% to +17%</td>
<td>-37 to +49</td>
<td>-5% to +6%</td>
</tr>
<tr>
<td>San Francisco Multi-family</td>
<td>-20% to +26%</td>
<td>-72 to +74</td>
<td>-9% to +9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wholesale price region</th>
<th>Default rate variation (bp)</th>
<th>Default rate variation relative to TREPP avg (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denver area</td>
<td>+159 to +501</td>
<td>+20% to +63%</td>
</tr>
<tr>
<td>Northern California</td>
<td>-49 to +705</td>
<td>-6% to +88%</td>
</tr>
</tbody>
</table>
"These results showing the impact of energy on default risk are clearly meaningful. I don't currently consider energy efficiency when making a loan and seeing this makes me think I would want to ask about it”

"I would like to apply these findings but would want an easy way to use it. A simple score or ratio for energy risk would be good. In fact, I would be interested to pilot test it."

Keith Hanley, Silicon Valley Bank
Looking ahead

**Vision:**

*Energy factors are fully and routinely incorporated in commercial mortgage valuation, accelerating demand for buildings with lower energy risk.*

- **Year 1:**
  - Analysis of energy impacts on mortgage valuation

- **Year 2:**
  - Pilot case studies on actual mortgage loans

- **Year 3:**
  - Best practices protocols for lenders and owners

- **Long term:**
  - Institutionalize

- **Show that energy matters**

- **Develop and pilot interventions**

- **Broader deployment**

- **Industry Standards**
Recommendations

**Lenders:**
- Ask owners to provide info on energy cost range.
  - Account for variations in energy use and energy price.
  - Could be done as part of Property Condition Assessment.
  - Can reference ASTM standard
- Incorporate energy risk factor into underwriting and terms
  - e.g. Interest rate discount for lower risk
- Offer additional loan proceeds for EE investments

**Owners:**
- Ask lenders to account for energy efficiency when setting mortgage terms.
- Provide data on energy costs to lender.
  - Historical and anticipated
  - In appraisal and/or PCA
Acknowledgements

- Holly Carr (U.S. DOE)
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- Jeff Deason (LBNL)
- Tianzhen Hong (LBNL)
- Paulo Issler (UCB)
- Emily McLaughlin (IMT)
- Bob Sahadi (IMT)
- Baptiste Ravache (LBNL)
- Kaiyu Sun (LBNL)
BUILDING SUSTAINABILITY

WE ARE DEDICATED PROFESSIONALS THAT STRIVE TO IMPROVE THE PERFORMANCE OF BUILDINGS — CREATING VALUE THROUGH ENERGY & RESOURCE MANAGEMENT, REAL ESTATE STRATEGY, AND CRAFTING TRANSFORMATIONAL PROGRAMS FOR OUR CLIENTS.
The Appraisal Process

1. Identify the Need for Appraisal and Valuation
2. Define Scope of Work
3. Collect Property Data and Information
4. Analyze Property Data and Information
5. Apply Approaches to Value
6. Reconcile Value and Provide Final Opinion
7. Submit final report
Barriers

• Regulatory and market changes that increase commoditization of appraisals
  • Little budget or reward for making “unusual” adjustments, even when warranted
  • Fragmented, aging, and skeptical appraisal workforce
  • Lack of confidence in addressing green buildings

• Poor communication of high-performance building features amongst owners, lenders, and appraisers

• Lack of relevant education, training, and energy-related knowledge amongst appraisers
• Appraisers in the U.S.: 60,000
• Estimated commercial appraisers: 12,000
• Annual reduction in total workforce: 3%
• Appraisers over 50 years old: 62%
• Appraisers who are sole proprietors: 62%
• Appraisers not belonging to any professional association: 66%
Commercial Real Estate:
• CB Richard Ellis
• Colliers International
• Connecticut Green Bank
• Cushman & Wakefield
• Fannie Mae
• GRESB
• Home Innovation Research Labs
• Inspyrod
• Institute for Market Transformation (IMT)
• LaSalle Investment Management
• Lawrence Berkeley National Laboratory (LBL)
• MetLife
• PNC
• Security National Mortgage Company
• US EPA (ENERGY STAR)
• USGBC
• View Glass

Appraisal Industry:
• Akerson & Wiley
• DeLacy Consulting
• Earth Advantage
• Runde & Partners, Inc.
• Sustainable Values, Inc.
• The Appraisal Foundation (TAF)
• The Appraisal Institute (AI)
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Working Group Accomplishments

- **Sample Scope of Work Language for Appraisers Valuing High Performance and Energy Efficient Buildings**
- Online [Appraisal Toolkit](#) with tools, resources, and other information related to appraising green buildings
- Developed appraisal questions for the 2017 [GRESB Debt Survey](#)
- Upcoming: TAF APB Valuation Advisory for Green Commercial, Multifamily and Institutional Properties
• Large, influential owners

• Voluntary collaboration to address energy in the appraisal process

• Coordinating with Altus Group to revise scoping agreements

• Proposing greater emphasis on green and high-performance features during valuation

• Potential pilots to be conducted later in 2017
• Emphasis on applying outputs from three federal tools:
  • ENERGY STAR Portfolio Manager
  • Building Energy Asset Score
  • Building Performance Database

• Designed to build upon existing resources, and fill gaps in current trainings
  • Conducted in-person pilots
  • Achieved IDECC certification for live online training
Next Steps

- Create case studies on NAREIM ODCE index firms and pilot appraisals that incorporate new resources and emphasize valuation of green and high-performance building features
- Continue promoting the resources and toolkit
- Engage GRESB to include appraisal questions on Equity Assessment
- Adapt the *Energy Matters!* training into an asynchronous format
- Continue outreach and engagement efforts with lenders and appraisal leaders
Contact Us

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